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Comment

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People do care about the deep sea. A comment on Jamieson *et al.* (2020)

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In a paper in this journal entitled "*Fear and loathing of the deep sea: why don't people care about the deep sea?*", Jamieson et al. (2020) pose this question and answer it with many interesting perspectives from psychology, ocean literacy and philosophy. However, there is an inherent assumption in the question they ask that people do *not* care about the deep sea. In order to assess this assumption, we contend that the first question to ask is: *do* people care about the deep sea? Based on the cultural significance of the theme of the deep ocean in art and literature, the results of ocean attitudinal surveys and the work done on deep sea economic valuation in recent years, we suggest that the answer is that people *do* care about many different aspects of the deep sea, not only the ones that hold market value, but also non-market values. It is nonetheless argued that the welfare benefits that societies gain from the deep sea are not at the fore in political discussions or marine policy making.

Keywords: deep sea, valuation, willingness to pay.

Introduction

In a very interesting and well-written paper Jamieson *et al.* (2020) attempt to answer the question of why people do not care about the deep sea. The reasons given are fascinating and span disciplines such as psychology and philosophy. However, the authors take it as given that people do not care about the deep sea. They never ask the initial question of *do* people care about deep offshore ocean areas? They take it that the answer is no, despite this question having already been asked extensively in the environmental attitudinal and valuation literature, a subset of natural resource and environmental economics, and having been given an affirmative answer there (Jobstvogt *et al.*, 2014; LaRiviere *et al.*, 2014; Aanesen *et al.*, 2015; Armstrong *et al.*, 2019; Börger *et al.*, 2020), as well as in other related social science studies (Zanoli *et al.*, 2015; Folkersen *et al.*, 2019; Kaikkonen and van Putten, 2021). More recent work corroborates and expands upon this (Hynes *et al.*, 2020; O'Connor *et al.*, 2020; Ankamah-Yeboah *et al.*, 2021; Chen *et al.*, 2021; O'Connor *et al.*, 2021; Xuan *et al.*, 2021), demonstrating that even during the difficult circumstances of the COVID pandemic people still do care about the deep sea. (Hynes *et al.*, 2021). In the following, we first reflect upon the presence of the deep sea in art. Then we briefly outline the methodologies used to assess whether and how people care about the deep sea, focusing particularly on the stated preferences approaches. This is followed by a brief presentation of several studies of preferences for deep sea attributes. We end with some conclusions.

The deep sea in art

Where Jamieson *et al.* (2020) see "fear and loathing", a more optimistic observer may see fascination and wonder. Whether it be characterized as "deep and dark blue" (Byron, 1812, CLXXIX), "wine-dark" (Homer in the *Iliad* and the *Odyssey*), or "snotgreen" and "scrotumtightening" [Joyce, 1922, section I(1)]; as "wilful, turbulent, and wild" (Wynne, 1919, p.139), or "mystic currents that softly glide" (Wells, 1921, p.123), it is undeniable that the sea, with its "many gods and many voices" [Elliot, 1943, 3(I)], has been a significant source of inspiration for art of all forms since the dawn of human culture.

Admittedly, most of this does not *specifically* reference the deep sea in the modern scientific sense. Depth is rarely made explicit, but often falls short of being "deep" [e.g. Prince Ferdinand's father's repose at "full fathom five" in Shakespeare's *The Tempest* is a few hundred fathoms too shallow; guid *Sir Patrick Spens* (the anonymous Scottish poem) and the Scots lords lie at a more respectable 50, but that remains stubbornly photic, despite the reported proximity to Aberdour]. But this is a detail: the themes and metaphors of unfamiliarity, hidden beauty, the limits of human power and comforts of oblivion and the infinite all find their terrestrial apotheosis in the depths of the sea, where "Sheer miracles of loveliness/Lie hid in its unlooked-on bed" (Rossetti, 1858) and "peaceful sleep is ever there/Beneath the dark blue waves" (Hawthorne, 1825). Indeed, the sea in art often stands in juxtaposition to the familiar and the known, and "oceanic tropes, from the perils of shipwreck to the frustrations of navigation, can serve as powerful antidotes to pastoralism and other representations of landed stability" (Mentz, 2009).

Some art is quite explicitly concerned with the inaccessible and unseen realms deep beneath the waves. Verne's Twenty Thousand Leagues Under the Seas has left a huge cultural legacy. More recently, Disney's "The Little Mermaid" captured the imagination of a generation of children and became

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a huge franchise. Of course, a proportion of deep sea-related art does play to fear of the unknown, especially in film. But the *frisson* of controlled exposure to fictional dangers is not the same as fear and loathing.

Deep sea non-fiction has also been hugely significant, and perhaps speaks more directly to the genuine affection and wonder that many people feel towards this environment. Most of this has only become possible through modern technologies allowing access to previously unexplorable depths. The successes of documentary film (Attenborough's *The Blue Planet—Into the Deep*), popular science writing (Claire Nouvian's *The Deep*), and visual art (Lily Simonson's *Painting the Deep* and other works) all demonstrate the fascination and awe that deep sea ecosystems and habitats continue to inspire, at least in sections of the general public.

Attitudinal surveys and stated preference valuation of the marine environment

Over the last decade, a number of studies have assessed societal attitudes to the marine environment and the deep sea. Potts *et al.* (2011) suggested that ocean health was relatively low on the environmental issues priority list of European citizens with just under 50% of the 7000 respondents considering ocean health as a particularly important issue of concern for society. More recently such studies have seen this concern increase not just for general ocean health and ocean related issues (Hynes *et al.*, 2014; European Commission, 2019) but also for the deep ocean ecosystems (Ankamah-Yeboah *et al.*, 2020; O'Connor *et al.*, 2021). Regarding respondents' perception of whether changes in the deep-sea has a "personal effect on them", Ankamah-Yeboah *et al.* (2020) found that 61% of Scottish and 62% of Norwegian's perceived it has "some effect" on them, respectively. In a recent pan European survey on attitudes to oceans and human health it was two deep-sea issues that were of most concern to citizens (H2020 SOPHIE Consortium, 2020). Out of 14 marine activities, deep-sea mining and offshore oil/gas operations were perceived, by the 14167 respondents to the survey, as the most harmful for both the marine environment and public health and wellbeing.

In the field of environmental valuation, economists have been working intensely since the 1970s assessing how human beings value natural environments. Economists have not only been interested in the market or use values connected to natural resource extraction, but also the non-use values. Non-use values encompass what has been coined existence values, or human valuation of the pure existence of natural environments, as well as bequest values, or the value connected with ensuring the possibility for future generations being able to also enjoy natural environments. Indeed, this field of economics has opened a vast realm of research in how to elicit such values in a scientifically sound way, as they are not apparent in markets, and require direct and indirect surveys, which otherwise are not often applied in economics. The first step into prominence occurred after the Exxon Valdez oil tanker grounding in Alaska in 1989, where for the first time economic valuation was included in the legal battle for reparations, and led to the development of guidelines for valuation being developed by a prestigious group of Nobel Prize winning economists (Arrow *et al.*, 1993). Over the last 40 years the field of stated preference valuation has seen remarkable growth, and the honing of survey development, data collection and analysis in this area of research has been substantial, providing for the increasing demand for scientific input in relation to management decisions (Whittington *et al.*, 2017; Hanley and Czajkowski, 2019).

Hence, with the intensified human pressure on ocean environments, and even the deep sea, there has been a growing interest in the values to be found there, both for blue growth and in relation to ecosystem services outside of markets. We briefly review some of these economic studies of the deep sea to illustrate the fact that people do care, or at least have preferences for conservation of the deep sea, and are willing to pay for its protection.

Studies of public preferences for the deep sea

Though most studies of non-market values relate to terrestrial environments, there is a growing literature on marine and also deep sea valuation (Torres and Hanley, 2017). Commercial fisheries have been extensively studied worldwide, but in recent years also non-commercial, or non-use values have been researched, which we concentrate on here. Surveys of the general public in relation to protecting deep sea environments in Scotland (Jobstvogt *et al.*, 2014; Hynes *et al.*, 2020), Norway (LaRiviere *et al.*, 2014; Aanesen *et al.*, 2015), Ireland (Wattage *et al.*, 2011; Aanesen *et al.*, 2021), Italy (O'Connor *et al.*, 2020; Chen *et al.*, 2021), and Canada (Xuan *et al.*, 2021), as well as comparisons between several of these countries, have been carried out (Ankamah-Yeboah *et al.*, 2021; Xuan *et al.*, 2021), showing an overall willingness to pay to protect these relatively unknown and far removed environments. Most of these studies focus on waters within national jurisdiction, but some surveys include international waters (Xuan *et al.*, 2021).

Initially, willingness to pay to protect cold water coral reefs, the largely deep-sea cousins of the tropical corals, were assessed (LaRiviere *et al.*, 2014; Aanesen *et al.*, 2015). Deep-sea cold water corals may be thought to be an anomaly regarding deep sea preferences, due to their exotic and charismatic nature. However, studies show willingness to pay to protect a broader set of deep sea option values, i.e. the potential for future values that the deep sea may provide (Jobstvogt *et al.*, 2014). Furthermore, people valued cold water coral protection for other reasons than purely their existence, with potential provision of habitat for fish being a central attribute that was prioritized (Armstrong *et al.*, 2019). Indeed, when assessing different attributes in the deep sea, reducing marine litter on the seabed, and securing habitats for deep-sea fish stocks were largely prioritized ahead of new blue jobs creation (Ankamah-Yeboah *et al.*, 2021), indicating not only that people care for the deep sea, but that they care for attributes of the deep sea that do not directly benefit them. In these surveys, especially the so-called choice experiments, the respondents are forced to make trade-offs, often between conservation and economic activity, illustrating their preferences, and their willingness to pay, or care, for protection of deep sea environments.

Conclusion

One may question whether studies of preferences for deep sea conservation provide evidence that people care about it. Is willingness to pay for conservation an example of care? And does knowledge of the deep sea encourage care, or at least reduce fear? These may be pertinent psychological, philosophic, or linguistic questions in relation to the studies we

have referred to. On the other hand, one can also query the assumption that the general public do not in some way care about an environment only due to it being far away, relatively unknown and inaccessible, given the increasing realization of the importance of natural environments for human well-being (MEA, 2005; Costanza *et al.*, 2014). Indeed, Kaikkonen and van Putten (2021) found in a global survey that even though the public cared more about remote terrestrial environments and Antarctica than the deep sea, 81% of the respondents expressed that they cared a lot or very much about human harm to the deep sea. The same study shows that degree of perceived knowledge about the environment in question was inversely related to degree of care, pointing to the age old adage that fear is all about ignorance. Hence, if parts of the public do indeed fear the deep sea, then this may be attributed to lack of knowledge, underlining the importance of all endeavours to increase deep sea literacy.

Nonetheless, it is not surprising that Jamieson et al. (2020) feel the deep sea is unloved, given the way our oceans are treated. The actual integration of environmental valuation into deep-sea policy is not without its challenges, and environmental economists presumably feel their research goes as unnoticed as the ecologists do (Hanley et al., 2015; Börger *et al.*, 2020; Tinch *et al.*, 2021). How we treat the deep sea is; however, not very different to how we treat many other well-known, closer to home, and appreciated parts of our planet. The problem is presumably not that humans do not care about nature, or the deep sea, but rather that we are not able to ensure good decision making and management of our planet. Public outreach regarding environmental valuation research is often employed to show politicians and decision makers that environmental policies are valued and given priority by the public. Even though these valuation studies demonstrate that people care about the deep sea, it is obvious that establishing willingness to pay to protect deep sea environments may still not be sufficient to ensure or even defend their protection.

Recent studies have also shown a willingness to pay for deep sea restoration (O'Connor *et al.*, 2020) and that such projects can be defended from a cost-benefit analysis perspective (Chen *et al.*, 2021). Nonetheless, many ecosystem services are both temporally and spatially removed from their origin, the deep sea, complicating evaluation (Armstrong et al., 2012). Lack of scientific knowledge of deep sea processes has led to recommendations to identify values connected to supporting services to prevent irreversible damage to deep sea ecosystems, and the services they provide (Folkersen et al., 2019). Trading off commercial and non-commercial as well as direct and indirect use values connected to the deep sea in bio-economic models have illustrated that non-use and indirect use deep sea values have a role to play in managing commercial species (Armstrong *et al.*, 2017). Indeed, some will claim that care for the deep sea is reflected in the multitude of national, regional, and international efforts to protect and preserve marine environments. These efforts include the United Nations Convention on the Law of the Sea (UNCLOS), The International Convention for the Prevention of Pollution from Ships (MARPOL), The International Seabed Authority (ISA), and the Sustainable Development Goals (SDG14). How successful these efforts are can clearly be questioned (Rogers *et al.*, 2015). But the lack of successful protection does not detract from the concern that drives these endeavors, and which can hardly be claimed to emanate from fear and loathing.

Returning now to Jamieson et al's (2020) article. The only actual description of humans not caring about the deep sea is in a reference to Charles Saxon's 1983 cartoon in the *New Yorker*, where a group of women sit around a coffee table, and one turns to the other saying; "I don't know why I don't care about the bottom of the ocean, but I don't". Unsurprisingly, this is a joke, and should be treated as such. People *do* care about the deep sea. Deeply.

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